

Three new species of *Paradirphia* (Saturniidae: Hemileucinae) from Mexico and Central America with notes on the immature stages

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Abstract. Observation of the early stages and subsequent study of the genitalia revealed that, in addition to *P. semirosea* and *P. coprea*, three new species are involved in the *P. semirosea* complex in Mexico and Central America. *P. semirosea* and *P. coprea* are redescribed and lectotypes are designated. *P. boudinoti* and *P. valverdei* are described from northeastern and southern Mexico, respectively, and *P. winifredae* from Costa Rica and Panama. Type specimens are figured and male and female (when known) genitalia of the five species are illustrated. Species distribution is discussed and mapped. The immature stages of *P. semirosea*, *P. boudinoti* and *P. valverdei* are described with reference to larval food preferences in the laboratory.

Introduction

Paradirphia, with *Phricodia coprea* Draudt as type species, was originally described by Michener (1949: 146) as a subgenus of *Ormiscodes* Blanchard. Nine species were later included in the subgenus by Michener (1952: 445) in his major work on the Saturniidae of the Western Hemisphere. *Paradirphia* was then cited at full generic rank by Beutelspacher (1978, 1984) and Lampe (1986). The new status is entirely justified based on obvious differences in the general appearance and distinctive characters in the genitalia.

Paradirphia ranges from Mexico to Bolivia; it is mostly, if not exclusively, a montane genus, *P. geneforti* (Bouvier) ranging up to 2800 m in N Ecuador. It is represented by 10 species (including the new ones) in Mexico and Central America and three in South America where it is an exclusive inhabitant of the Andes. This paper was initiated by the junior author's observation of marked variability in the larvae of moths in which the wing pattern is so similar that all were originally believed to be *P. semirosea* (Walker). Subsequent study of the genitalia revealed that three species were involved in the reared material; further investigations led to evidence of at least four species in the *P.*

semirosea/*P. coprea* complex in Mexico, two hitherto unpublished. A third new species from the same group was found among specimens from Costa Rica and Panama.

Paradirphia semirosea and *P. coprea* will be redescribed prior to descriptions of the new taxa.

***Paradirphia semirosea* (Walker)**

(figs. 1, 2, 3, 11, 13, 16, 17, 18, 23, 24)

Dirphia semirosea Walker, 1855: 1359

Phricodia semirosea Walker; Draudt, 1930: 781

Dirphia semirosea Walker; Bouvier, 1935: 256

Dirphia semirosea Walker; Hoffmann, 1942: 243

Ormiscodes (Paradirphia) semirosea (Walker); Michener, 1952: 445

Phricodia semirosea ab. *roseana* Draudt, 1930: 781 (infrasubspecific name)

The species cited by Lampe (1986: 273) as *P. semirosea* is *P. boudinoti* n. sp. (see below).

Male. Head dark brown, labial palpi three-segmented, dark brown, usually scattered with purplish scales. Antennae pale stramineous, quadripectinate to the apex; apical rami shorter than basal rami, those of outer side less than one-third as long as those of the inner side of flagellum. Thorax covered with brown to red brown hairs intermixed with longer gray hair-like scales on the tegulae; legs dark brown, densely scattered with carmine red; epiphyses large, covered with long hairs, about as long as two thirds of the tibia; a single subapical spur on metathoracic tibia. Abdomen dorsally black, broadly ringed with carmine red, ventrally dark brown with intermixed carmine scales. Forewing above brown, more or less suffused with purplish, especially on lower half of baso-medial area and both sides of submarginal band; veins and fringes brown; lines cream white, angled as shown in figs. 1, 2, and 3, the antemedial three-sectioned, the postmedial usually continuous, emphasized with white dots at the intersection of the veins. Forewing below dark brown, more or less suffused with purplish; postmedial line straight, shaded with brown. Hindwing above purplish, in some specimens darkened with blackish brown especially on baso-medial area; postmedial line black with two small, usually fused, subcostal white spots. Hindwing below about same coloration as above; postmedial line white, usually strongly contrasting, with or without white dots. The absence of discal spots is a characteristic wing pattern feature of the *P. semirosea* group. Length of forewing 30-35 mm.

Female. Antennae shortly bipectinate to the apex. Epiphysis absent. Ground color usually lighter than in male with an extension of the lightest areas tending toward purplish pink or pink instead of purplish. Averaging larger than the male; forewing 35-40 mm.

P. semirosea is the most variable of the five species studied. Pink forms were named by Draudt (1930:781) aberration *roseana*. Provisions of the Code do not apply to this name published at an infrasubspecific rank (Art. 45a). The markings also vary, especially the postmedial lines, above and below.

Male genitalia (figs. 18A, B, 23A). Uncus down-curved apically, simple, slightly notched at the apex. Valves very broad, trilobed, the lower portion of the proximal lobe connected to the transtilla; a very strong spine, posteriorly produced, arising from the inner side of the valvula. Lateral arms of the transtilla medially fused in a strongly sclerotized subtrapezoidal ventral plate. Juxta deeply concave, broadly fused to the anterior portion of the valves with lateral sides posteriorly produced as strongly sclerotized processes. Aedeagus straight; the vesica has a strong hook-like cornutus.

Female genitalia (fig. 18C). Sclerotization of the eighth sternum post-vulvar with medial portion posteriorly prominent and laterally fusing to the eighth sternum and to the anapophyses. Sclerotization of the eighth tergum bilobed. Ductus bursae chitinized; pyriform bursa moderately bulky; ductus seminalis arising from the right side very close to the ductus bursae. Post-apophyses slightly longer than the anapophyses. Ovipositor well developed, covered with fine setae.

Types. *P. semirosea* was described by Walker (1855: 1359) from one male and one female. The male is hereby designated as the lectotype.

Lectotype: One male, locality unknown (43-58 = presented in 1853 by E. Doubleday Esq.) (genit. preparation D. Goodger) (British Museum, N. H.) (examined).

Distribution (fig. 24). MEXICO. VERACRUZ: 62 mi (100 km) SW of Nautla, 1290 m; Las Minas, 1385 m; Naolinco de Victoria; Orizaba, 1243 m. CHIAPAS: San Cristóbal de Las Casas, 2160 m; Oxchuc; 11 mi (18 km) W of Ocosingo, 1375 m; Pinola; Santa Rosa Comitán; Zapalota (= La Trinitaria); Las Delicias. OAXACA: 52mi (84km) NE of Guelatao, 1400m, El Portillo del Rayo, 1450 m. GUATEMALA. ALTA VERAPAZ: Mpio. San Cristóbal Verapaz, Hacienda Baléu, 1850 m; Cobán, 1200 m; BAJA VERAPAZ: Pantic, 1600 m; Santa Elena (La Cumbre); NE of Volcán Acatenango, 2200 m. COSTA RICA. CARTAGO: Tapantí, 1400 m; Moravia de Chirripó, Platanillo, 1150 m; *id.*, Tausito, 1200 m; Cantina de Río Macho, 1200 m.

P. semirosea is the most widely distributed species of *Paradirphia* in Central America where it is mainly recorded from moderate elevations from 1100 to 1500 m. The absence of records between Guatemala and Costa Rica is probably due to lack of collecting rather than to a gap in distribution.

Immature stages. See under group heading, also figs. 11, 13, 16, 17.

Material examined. Large series from the above cited localities; 22 specimens dissected.

Paradirphia coprea (Draudt)

(figs. 9, 10, 19, 24)

Phricodia coprea Draudt, 1930: 781

Dirphia coprea Draudt; Bouvier, 1935: 258

Dirphia coprea Draudt; Hoffmann, 1942: 243

Ormiscodes (Paradirphia) coprea (Draudt); Michener, 1949: 146

Ormiscodes (Paradirphia) coprea (Draudt); Michener, 1952: 445

Male. Antennae noticeably shorter than in *P. semirosea*, stramineous. *P. coprea* differs from *P. semirosea* mainly by the more uniform, duller brown of the

wings above and below as a result of less contrast between the light and dark areas, especially on the baso-median and the postmedian areas of the forewing. The markings are as in *P. semirosea*, but the postmedian line is less continuous, tending to fade between the dots on the veins. Forewing (lectotype) 38 mm.

Female. Same coloration and markings as in male. Forewing (paralectotype) 38 mm.

Male genitalia (fig. 19A, B). Differ from those of *P. semirosea* by the much shorter lateral sides of the juxta which are not posteriorly produced in strongly sclerotized processes, and in the extreme reduction of the cornutus. However, in some specimens doubtfully referred to this species (see distribution) a small hook-like cornutus is present.

Female genitalia (fig. 19C). The single specimen examined (paralectotype) presented a weaker structure than in *P. semirosea* with the bursa much smaller; the anapophyses are noticeably shorter than in the previous species.

Types. *P. coprea* was described by Draudt (1930: 781) according to three pairs from Cuernavaca, Mexico, all in his own collection. As the latter was destroyed during the Second World War, there was little hope of finding syntypes to identify this species with certainty. A search among museums where Draudt's type material is occasionally found (Museum für Naturkunde der Humboldt-Universität zu Berlin, British Museum (N.H.), Musée d'Histoire naturelle de la ville de Genève) was unsuccessful, but one male and one female syntypes were located in the American Museum of Natural History, specimens from the collection of the late Frank Johnson who probably purchased them from Draudt or Niepelt. Several other types of Saturniidae from the same source are likewise preserved. The male syntype is hereby designated as the lectotype, the female as paralectotype. Both were examined, and although old and somewhat faded (figs. 9, 10), still show the main characters of the wing pattern.

Lectotype: One male, Mexico, Morelos, Cuernavaca, VI.1912, n° 263, genit. preparation (in glycerine) C. Lemaire, n° 5217 (coll. Draudt, coll. Frank Johnson, American Museum of Natural History). Paralectotype: one female, same locality and collections, VII. 1909, n° 264, genit. preparation C. Lemaire, n° 5218.

Distribution (fig. 24). MEXICO: Type locality. The distribution as reported by Hoffmann (1942: 243): "Tierra templada de la cuenca superior del Río Balsas, Morelos, Sierra Volc. Transversal (hasta 2000 m). Jalisco" may refer to several different species. Specimens from the following localities are doubtfully identified as *P. coprea*: STATE OF MEXICO, Malinalco. GUERRERO, vicinity of Acuitlapan, 10 mi (16 km) NE of Taxco, 5000 ft (1524 m). OAXACA, Candelaria Loxicha, 550 m. In these specimens, unlike the lectotype, the vesica has a small hook-like cornutus. Although they do not otherwise differ, their identification will remain uncertain until additional topotypical material is available for comparison.

Immature stages. Unknown.

Material examined. Lecto- and paralectotype and seven questionable specimens; all dissected.

Paradirphia valverdei Lemaire & Wolfe new species

(figs. 4, 12, 15, 20, 24)

Male. Antennae more rusty yellow than in both previous species. Long hair-like scales of tegulae black, little intermixed with gray. Ground color of wings

above and below much darker brown than in *P. coprea*, almost black, with shades of purplish brown scarcely contrasting and confined to both sides of submarginal band on forewing and postmedian area of hindwing. Lines pure white and very contrasting; postmedian of forewing reduced to dots on the veins. Forewing length: 37-40 mm (holotype = 40 mm).

Female. The very damaged single known example (progenitor of the larvae) was unfortunately lost. It was collected at light in Veracruz, 62 mi (100 km) SW of Nautla, 1290 m, 1.VIII.1984, K. Wolfe, M. Valverde.

Male genitalia (fig. 20). A much larger structure than in *P. coprea*. Shape of valves differing with inner lobe (fused to the transtilla) larger, and posteriorly oriented spine noticeably stronger. Lateral sides of juxta more prominent than in *P. coprea* but not as much as in *P. semirosea*, and less sclerotized as in latter; connection of juxta to anterior portion of valves differs from *P. semirosea* (figs. 18, 23A). Cornutus minute or entirely lacking from vesica.

Types. Holotype: male, Mexico, Oaxaca 52 mi (84 km) NE of Guelatao, 1400 m, 27.VII.1987, K. Wolfe, M. Valverde, D. Mullins. Paratypes: two males, same locality, data and collectors; five males, 53 mi (85 km) NE of Guelatao, 1475 m, 30.VII.1984, K. Wolfe, M. Valverde; one male, Oaxaca, 45 mi (72 km) NE of Guelatao, 2000 m, 29.VII.1984; four males, Oaxaca, 54 mi (87 km) SW of Tuxtepec, 1260 m, 25.VII.1984, same collectors; one male, Veracruz, 62 mi (100 km) SW Nautla, 1290 m, 3.VIII.1984, same collectors.

The holotype and three paratypes are in the collection of the Muséum national d'Histoire naturelle, Paris, five paratypes are in the collection of the junior author, one paratype is in the San Diego Natural History Museum, one paratype each will be deposited in the Natural History Museum of Los Angeles County, the American Museum of Natural History, the Allyn Museum of Entomology, Sarasota, Florida, and the Colección Entomológica del Instituto de Biología de la Universidad Nacional Autónoma de México.

Distribution (fig. 24). *P. valverdei* is known only from the above cited localities at moderate elevations in Oaxaca and Veracruz where it is sympatric and synchronic with the more numerous *P. semirosea*.

Immature stages. See under group heading, also figs. 12, 15.

Material examined. 14 males; seven dissected.

This species is named after Marvin D. Valverde to show gratitude for his contribution to the collecting and the rearing of the material studied.

Paradirphia boudinoti Lemaire & Wolfe new species

(figs. 7, 8, 14, 21, 24)

Male. Antennae straw yellow. Like *P. coprea* and *P. valverdei*, this species differs from *P. semirosea* by the reduction of contrast between light and dark areas on wings above and below. Coloration not as dark as in *P. valverdei*, and one specimen from Mexico, Coahuila, Saltillo, with the purplish as contrasting as in lectotype of *P. semirosea*. Lines cream white as in *P. semirosea*, postmedian of forewing usually reduced to vein-dots but, in some specimens, as continuous as in *P. semirosea*. Forewing 33-36 mm (holotype = 35 mm).

Female. Slightly larger than male, same markings and coloration. Forewing (allotype) 40 mm.

Male genitalia (fig. 21A, B). Distinguished from three previous species by hypertrophy of inner lobe (fused to transtilla) and much longer spine of valves. Lateral sides of juxta not prominent as in *P. coprea*. Most characteristic feature

Table 1. Larval description of *Paradirphia*. *P. semirosea*, *P. boudinoti*, *P. valverdei*, sixth (last) instar.

	<i>P. semirosea</i>	<i>P. boudinoti</i>	<i>P. valverdei</i>
Head (0.5 mm)	orange, adfrontal sutures black	coral pink, adfrontal sutures black	blue green, adfrontal sutures black
Integument:			
—Dorsal and lateral areas	red-brown, speckled whitish	yellow, densely covered with black vermiculations	light green, broadly but indistinctly checkered with red
—Ventral area	duller, similar	similar	blue green
Dorsal band	broad, dark brown	almost inconspicuous, white	greenish white
Subdorsal, upper and lower sub-spiracular lines	white	greenish white	white
Spiracular band	dark brown	denser black markings	copper red
Subspiracular band	white	white	white
Thoracic legs	orange	orange	pale green
Abdominal legs	brown	black	blue green tipped with black
Anal plate	pink surrounded with black	orange	blue-green
Paranal lobes	pink surrounded with black	orange thinly surrounded with black	blue green surrounded with black
Spiracles	orange surrounded with black, then white	chestnut brown circled with black, then orange white	orange circled with white
Scoli	rusty orange brown, prothoracic spines, dorsal and subdorsal spines of abdominal segment 9 black	orange, spines orange interspersed with black	green, prothoracic spines, dorsal and subdorsal spines of abdominal segment 9 black

of armature is wedge-like shape of aedeagus; vesica lacking cornutus.

Female genitalia (fig. 21C). Differing from *P. semirosea* and *P. coprea* by less prominent medial portion of ventral plate. Narrow prevulvar belt present in both dissected specimens. Bursa noticeably bulkier than in *P. semirosea*.

Types. Holotype: male, Mexico, Tamaulipas, Gómez Farias, Rancho del Cielo, 1127 m, 8-11.V.1985, J. Boudinot. Allotype: female, same locality, dates and collector. Paratypes: eight males, one female, same locality, dates and collector; 18 males, San Luis Potosí, Ciudad del Maíz, E1 Platanito, Torre Forestal, 1160 m, 26.VII-1.VIII.1984, E. C. Welling (all in the Muséum national d'Histoire naturelle, Paris); two males, San Luis Potosí, 16 mi (26 km) E of Ciudad del Maíz, 1140 m, 2.VII.1983, K. Wolfe, M. Valverde (K. Wolfe collection); one male, San Luis Potosí, E1 Naranjo, 5.VIII.1975, T. W. Taylor (Natural History Museum of Los Angeles County); five males, five females, Puebla, Villa Juárez; four males, Puebla, San Juan Apulco (Allyn Museum of Entomology, Sarasota). One paratype each will be deposited in the American Museum of Natural History and in the Colección Entomológica del Instituto de Biología de la Universidad Nacional Autónoma de México.

Distribution (fig. 24). *P. boudinoti* is widely distributed in NE Mexico from Coahuila to Puebla, its southernmost range meeting the northernmost of *P. semirosea*. Additional records are from COAHUILA, Saltillo, 1599 m, and HIDALGO, 70 mi (113 km) S of Tamazunchale, 1700 m. *P. boudinoti* probably lives in drier areas than *P. semirosea*.

Immature stages. See under group heading, also fig. 14.

Material examined. 32 specimens; 11 dissected.

This species is named after Jacques Boudinot of the Department of Entomology of the Muséum national d'Histoire naturelle, Paris, to express gratitude for the collecting of a great part of the type material during his mission to Mexico in July and August 1985.

Paradirphia winifredae Lemaire & Wolfe new species

(figs. 5, 6, 22, 23, 24)

Male. Antennae straw yellow. Red scales on thorax and legs, dorsal rings on abdomen paler pink, not carmine as in four previous species. Ground color dark gray brown as in *P. boudinoti*; purplish zones on forewings confined to postmedian area, especially between postmedian line and submarginal band

- Fig. 1. *Paradirphia semirosea* male, Mexico, Veracruz, Las Minas, 1385 m, *ab ovo*, Escondido, California, on *Robinia pseudoacacia*.
- Fig. 2. *Paradirphia semirosea* female, Chiapas, 11 mi. (18 km) W. of Ocosingo, 1375 m, 21.VII. 1987 (K. Wolfe, M. Valverde, D. Mullins).
- Fig. 3. *Paradirphia semirosea* male (extreme pink phase), Chiapas, 15 mi (25 km) W of Ocosingo, 1325 m, 10.VIII.1985 (K. Wolfe, M. Valverde).
- Fig. 4. *Paradirphia valverdei* new species, paratype male, Mexico, Oaxaca, 52 mi (84 km) NE of Guelatao, 1400 m, 27.VIII.1987 (K. Wolfe, M. Valverde, D. Mullins).
- Fig. 5. *Paradirphia winifredae* new species, paratype male, Costa Rica, Cartago, Tapantí, 1540 m, 10.VII.1988 (K. Wolfe, M. Valverde).
- Fig. 6. *Paradirphia winifredae* new species, paratype female, Costa Rica, Cartago, El Empalme, 2000 m, 6.IV.1978, (K. Wolfe, M. Valverde).
- Fig. 7. *Paradirphia boudinoti* new species, paratype male, San Luis Potosí, 16 mi (27 km) E of Cd. Maíz, 1140 m, 2.VII.1983 (K. Wolfe, M. Valverde).
- Fig. 8. *Paradirphia boudinoti* new species, allotype female, Mexico, Tamaulipas, Gómez Farias, Rancho del Cielo, 1127 m, 8/11.1985 (J. Boudinot) (Muséum national d'Histoire naturelle, Paris).
- Fig. 9. *Paradirphia coprea* lectotype male, Mexico, Morelos, Cuernavaca, VI.1912 (American Museum of Natural History).
- Fig. 10. *Paradirphia coprea* paralectotype female, same locality, VII. 1909 (American Museum of Natural History).
- Fig. 11. First instar larvae of *Paradirphia semirosea* (similar to first instar of *P. valverdei* and *P. boudinoti*), Mexico, Chiapas, 18 mi (29 km) W of Ocosingo, *ab ovo*, Escondido, California, on *Robinia pseudoacacia*.
- Fig. 12. Fourth instar larva of *Paradirphia valverdei* (similar to fourth instar of *P. semirosea* and *P. boudinoti*), Mexico, Veracruz, 62 mi (100 km) SW of Nautla, 1290 m, *ab ovo*, Escondido, California, on plum.
- Fig. 13. Larva of *Paradirphia semirosea* sixth (last) instar, Mexico, Chiapas, 11 mi (18 km) W of Ocosingo, 1375 m, *ab ovo*, Gordes (France) on *Robinia pseudoacacia*.
- Fig. 14. Larva of *Paradirphia boudinoti* sixth (last) instar, Mexico, Hidalgo, 70 mi S of Tamazunchale, 1700 m, *ab ovo*, Escondido, California, on *Robinia pseudoacacia*.
- Fig. 15. Larva of *Paradirphia valverdei* sixth (last) instar, same data as fig. 12.
- Fig. 16. Eggs of *Paradirphia semirosea*, Mexico, Chiapas, same data as fig. 13.
- Fig. 17. Pupae of *Paradirphia semirosea*, same data as above.





where they form a contrasting, well delineated band from costa to inner margin. Lines less conspicuous than in all previous species, postmedian usually reduced to white vein-dots, the one on the inner margin line being as small as those on veins Culb to M1. *P. winifredae* averages larger than *P. semirosea*. Forewing 34-39 mm (holotype = 39 mm) versus 31-35 mm in examined *P. semirosea* males from Costa Rica.

Female. Larger and darker than male, with purplish brown zone on forewing proximal to submarginal band less conspicuous. White vein-dots on ante- and postmedian lines especially small, except subcostal. Forewing (allotype) 40 mm.

Male genitalia (figs. 22A, B, 23B). Resembling those of *P. semirosea* in having lateral sides of juxta well prominent. Differing in shape of valves and in connection of inner portion of valves to juxta, as shown in fig. 23. Vesica has strong hook-like cornutus as in *P. semirosea*.

Female genitalia (fig. 22C). Same structure as in *P. semirosea*.

Types. Holotype: male, Costa Rica, Cartago, Tapantí, 1660 m, 22.VIII.1984, F. Bénéluz (genit. preparation in glycerine, C. Lemaire, n° 5075). Allotype: female, Costa Rica, Puntarenas, Monteverde, Río Guacimal, Nuboso, 1550 m, 8.IX.1983, J.-M. Cadiou, W. Haber (genit. preparation in glycerine, C. Lemaire, n° 5102). Paratypes: two males, Cartago, Tapantí, 1600 m, 8.VI., 15.XII.1985, F. Bénéluz, Muséum national d'Histoire naturelle, Paris; one male, Cartago, Tapantí, 1540 m, K. Wolfe, M. Valverde; one female, Cartago, El Empalme, 2000 m, 6.VIII.1978, same collectors (collection of junior author); two males, Alajuela, Volcán Poás, 2350 m; one male, Cartago, 16 km S of Cartago on Pan American Highway, 1800 m; one male, Puntarenas, Monteverde, 1300 m; two males, San José, Parque Nacional Braulio Carillo, Estación Zurquí, 1500 m (collection of the University of Pennsylvania, Philadelphia); 15 males, Panama, Santa Clara de Chiriquí, 1600 m, 5.VI.1968, C. Moinier (Muséum national d'Histoire naturelle, Paris). One paratype each will be deposited in the Natural History Museum of Los Angeles County, the American Museum of Natural History, and the Allyn Museum of Entomology.

Distribution (fig. 24). In addition to the above cited localities, there are records from Panama, Chiriquí, road from Gualaca to Fortuna, km 32, Hornito, 1000 m; El Hato del Volcán, Quebrada Tisingal, 1400 m; Boquete, Alto Quiel, 1700 m. Although occurring in neighboring areas, *P. winifredae* and *P. semirosea* are probably allopatric or only occasionally sympatric. In Monteverde, Costa Rica, where both species occur in the same area of montane rainforest, *P. winifredae* has been collected at higher elevations than *P. semirosea*.

Immature stages. Unknown.

Material examined. 36 specimens; 18 dissected.

This species is named after Winifred Hallwachs, for her contributions to the knowledge of the Saturniidae of Parque Nacional Santa Rosa, Guanacaste, Costa Rica.

Immature stages (*P. semirosea*, *P. boudinoti*, *P. valverdei*)

Egg (fig. 16). Diameter ca. 1.5 mm, yellow to greenish yellow, becoming gray about five days before hatching.

Larva (Figs. 11-15). Length ca. 2.5 mm (first instar) to 65-70 mm

(last instar). There are six instars (five molts) and spination and pattern of markings are typically hemileucine. The arrangement of scoli is as in *Leucanella leucane* (Geyer) (see Lemaire, 1971: 30), and is as follows: Thoracic segments, abdominal segments 1, 2, 7 bear four pairs (subdorsal, prespiracular, upper and lower subspiracular); abdominal segments 3-6, three pairs (lower subspiracular absent); abdominal segment 8 has subdorsal pair fused into a single dorsal scolus + three pairs as in abdominal segment 7; abdominal segment 9 has dorsal scolus as in segment 8, but removed to posterior end of segment + three pairs (upper subdorsal, lower subdorsal, subspiracular); abdominal segment 10 has paranal scoli present. In the first instar, subdorsal and prespiracular pairs on thoracic segment and dorsal scolus on abdominal segments 8 and 9 are apically forked.

There are usually distinctive generic characters in the larvae of Hemileucinae, such as the rosette-type dorsal scoli in *Hemileuca* and the hypertrophied upper subdorsal scolus of abdominal segment 9 in *Periphoba* (see Gardiner, 1982: 145, *P. arcaei*, figured as "*P. hircia*"). The most characteristic features in the larvae of *Paradirphia* studied are 1) the absence of obviously predominant scoli, and (2) the slightly longer subdorsal and prespiracular scoli on the prothoracic segment and longer lower subdorsal pair on abdominal segment 9. Structure of the different groups of scoli is unusually indistinct.

There are distinctive specific characters in the larvae of *Paradirphia* which were studied, especially in the color of the integument; sixth instar larvae of *P. semirosea*, *P. valverdei*, and *P. boudinoti* are respectively orange and brown, green and red, and yellow and black.

Lampe (1986: 273) described the immature stages of *P. boudinoti* logically referring to them as *P. semirosea*, unaware of the features which gave rise to this study.

A comparative description of the 6th instar larvae of *P. semirosea*, *P. valverdei*, and *P. boudinoti* is given in table 1.

Pupa (fig. 17). Unlike most of the Hemileucinae, the larvae of the species of *Paradirphia* reared do not spin cocoons. Before pupation, the larvae leave the plant in search of a pupation site. There are no traces of silk in the pupal chamber formed in the soil at a depth of 10 cm or more. The pupa of *P. semirosea* is ca. 30 mm long, black and smooth, with thoracic segments rounded. Cremaster is simple, prominent, bearing a tuft of strong hooks at the anal end.

Larval hostplant preferences (in the laboratory). *P. semirosea* preferred *Robinia pseudoacacia* (Leguminosae) over a variety of other plants offered in California and France; *P. boudinoti* accepted plum (*Prunus*: Rosaceae) in France, plum and *R. pseudoacacia* in California, and *Malus* (Rosaceae) in Germany; *P. valverdei* preferred plum in California. Native host plants are unknown.

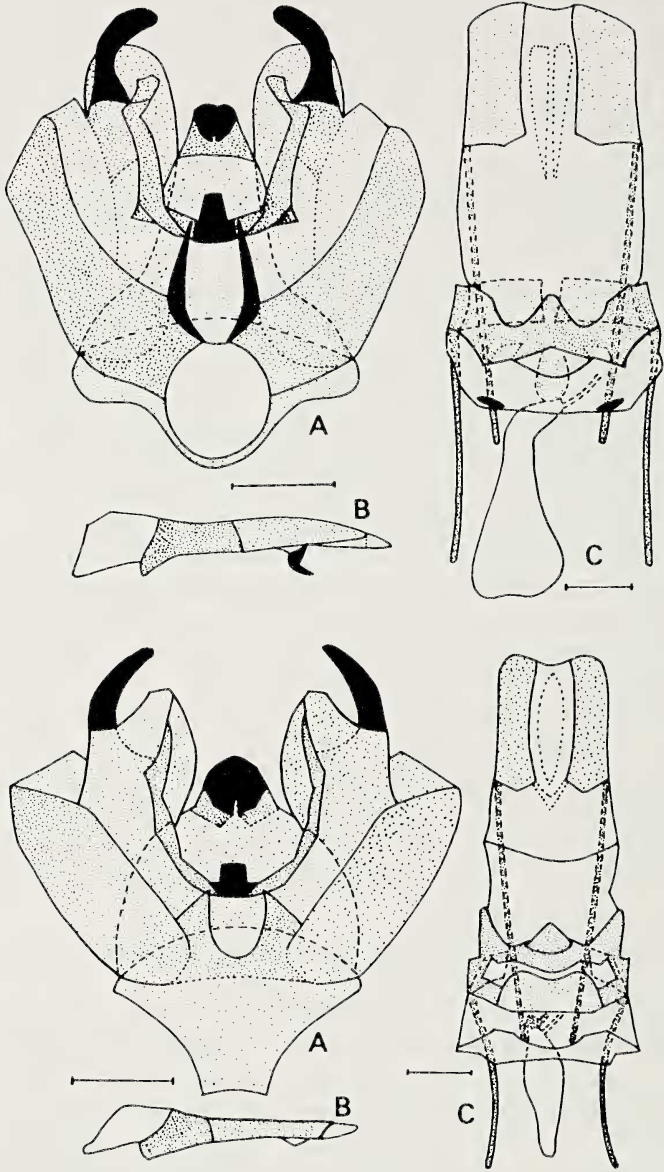


Fig. 18. Genitalia of *Paradirphia semirosea*. A. Male, aedeagus removed, ventral view; B. Aedeagus, lateral view; C. Female, ventral view, Scale line = 1 mm.

Fig. 19. Genitalia of *Paradirphia coprea*. A. Male (lectotype), aedeagus removed, ventral view; B. Aedeagus, lateral view; C. Female (Parallectotype), ventral view. Scale line = 1 mm.

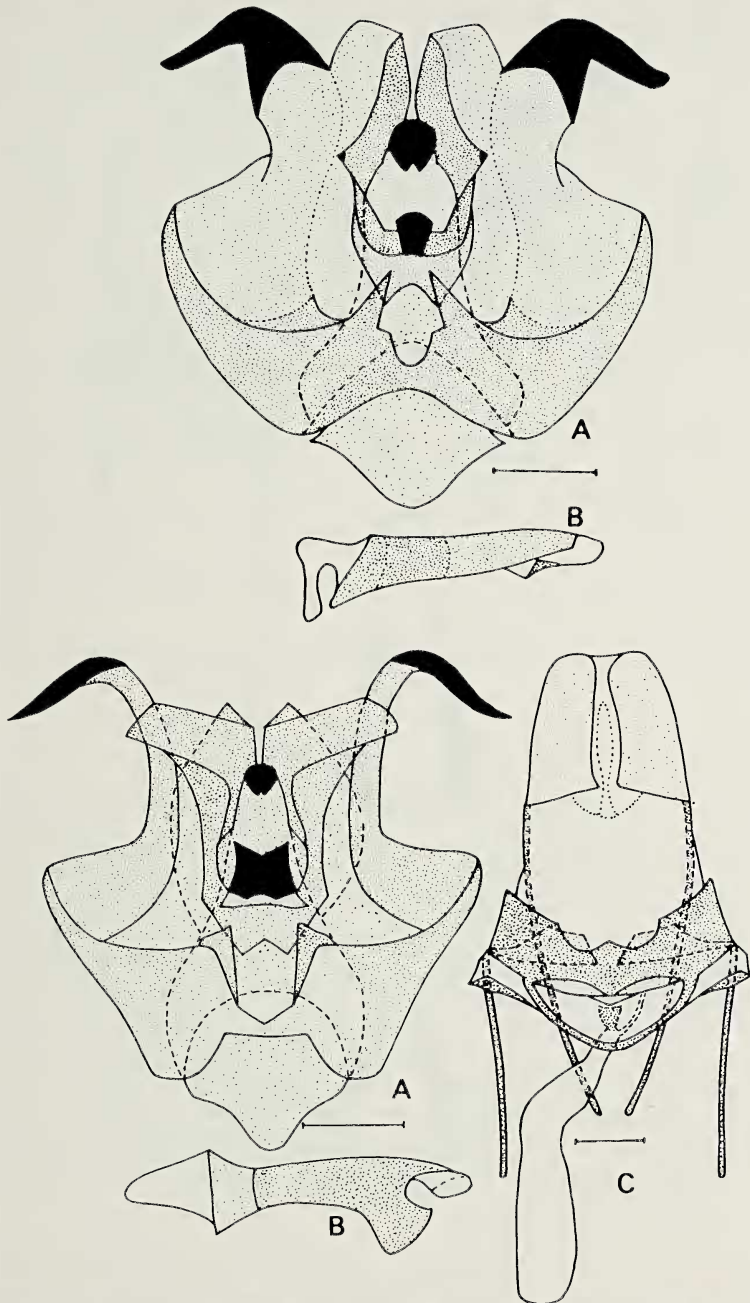


Fig. 20. Male genitalia of *Paradirphia valverdei* new species. A. Aedeagus removed, ventral view; B. Aedeagus, lateral view. Scale line = 1 mm.

Fig. 21. Genitalia of *Paradirphia boudinoti* new species. A. Male, aedeagus removed, ventral view; B. Aedeagus, lateral view; C. Female, ventral view. Scale line = 1 mm.

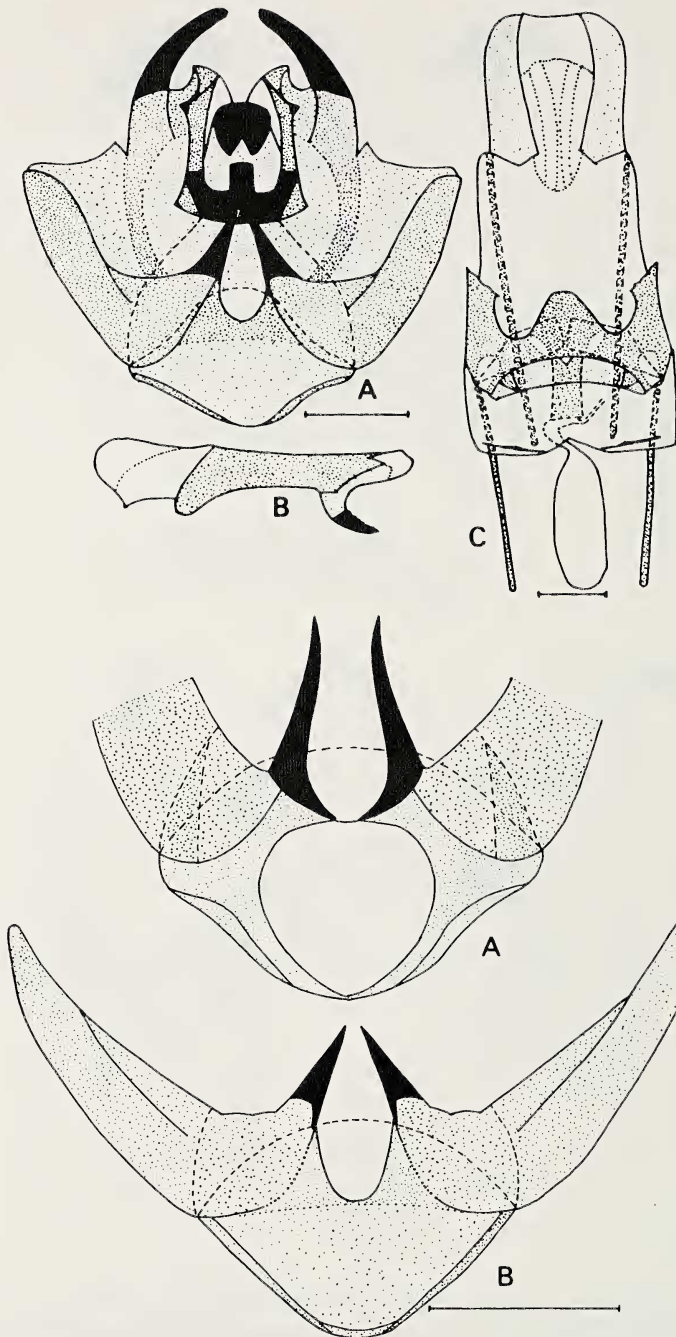


Fig. 22. Genitalia of *Paradirphia winifredae* new species. A. Male, aedeagus removed, ventral view; B. Aedeagus, lateral view; C. Female (allotype), ventral view. Scale line = 1 mm.

Fig. 23. Juxta and anterior portion of the valves in genitalia of *Paradirphia*. A. *P. semirosea*; B. *P. winifredae*. Scale line = 1 mm.



Fig. 24. Geographical distribution in Mexico and Guatemala of the species of *Paradirphia* studied.

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